CLAIMS

We claim:

1. A composition comprising an electrode comprising:

a) a self-assembled monolayer; and

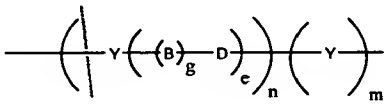
b) a metal ion ligand covalently attached to said electrode via a conductive oligomer.

2. A composition according to claim 1 wherein said electrode comprises a plurality of different metal ion ligands.

3. A composition according to claim 1 wherein said metal ion ligand is phenanthroline.

4. A composition according to claim 1 wherein said conductive oligomer is selected from the group consisting of:

i)



wherein

Y is an aromatic group;

n is an integer from 1 to 50;

g is either 1 or zero;

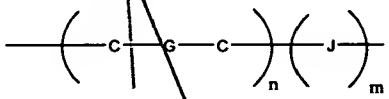
e is an integer from zero to 10;and

m is zero or 1;

wherein when g is 1, B-D is a conjugated bond; and

wherein when g is zero, e is 1 and D is preferably carbonyl, or a heteroatom moiety, wherein the heteroatom is selected from oxygen, sulfur, nitrogen, silicon or phosphorus; or

ii)



wherein

n is an integer from 1 to 50;

m is 0 or 1;

C is carbon;

J is carbonyl or a heteroatom moeity, wherein the heteroatom is selected from the group consisting of oxygen, nitrogen, silicon, phosphorus, sulfur; and

G is a bond selected from alkane, alkene or acetylene, wherein if m = 0, at least one G is not alkane.

5. A method of detecting a metal ion comprising:

a) applying a first input signal to an assay complex comprising:

i) an electrode comprising:

1) a self-assembled monolayer;

2) a metal ion ligand covalently attached to said electrode via a conductive oligomer;

ii) a metal ion;

b) detecting a change in the faradaic impedance of the system as a result of the association of the metal ion with the metal ion ligand.

6. A method of detecting a non-nucleic acid target analyte in a sample comprising:

a) applying a first input signal to an assay complex comprising:

i) a redox active complex comprising:

1) a redox active molecule;

2) a binding ligand that will bind the target analyte; and

ii) a target analyte;

wherein at least one component of said assay complex is covalently attached to an electrode via conductive oligomer; and

b) detecting a change in the faradaic impedance of the system as a result of the association of the redox active molecule with the target analyte, if present.

7. A method according to claim 6 wherein said electrode further comprises a self-assembled monolayer.

8. A method according to claim 6 wherein said input signal comprises an AC component.

9. A method according to claim 8, wherein said input signal further comprises a DC component.

10. A method according to claim 6 wherein said redox active molecule is covalently attached to said electrode.

11. A method according to claim 6 wherein said binding ligand is covalently attached to said electrode.

12. A method according to claim 6 wherein said redox active molecule is a transition metal complex.

13. A method according to claim 12 wherein said transition metal complex is ferrocene.

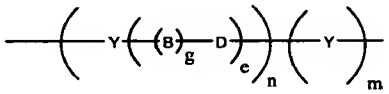
14. A method according to claim 6 wherein said redox active molecule is covalently attached to said binding ligand.

15. A method according to claim 6 wherein said detecting is by receiving an output signal characteristic of the presence of said analyte.

16. A method according to claim 15 wherein said output signal comprises a current.

17. A method according to claim 6 wherein said conductive oligomer is selected from the group consisting of:

i)



wherein

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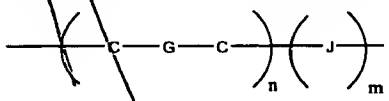
wherein when g is 1, B-D is a conjugated bond; and

wherein when g is zero, e is 1 and D is preferably carbonyl, or a heteroatom moiety, wherein the heteroatom is selected from oxygen, sulfur, nitrogen, silicon or phosphorus; or

ii)



wherein

n is an integer from 1 to 50;

m is 0 or 1;

C is carbon;

J is carbonyl or a heteroatom moiety, wherein the heteroatom is selected from the group consisting of oxygen, nitrogen, silicon, phosphorus, sulfur; and

G is a bond selected from alkane, alkene or acetylene, wherein if m = 0, at least one G is not alkane.

18. An apparatus for the detection of a non-nucleic acid target analyte in a test sample, comprising:

a) a test chamber comprising at least a first and a second measuring electrode, wherein said first measuring electrode comprises:

i) a self-assembled monolayer;

ii) a binding ligand covalently attached to said electrode via conductive oligomer;

b) a voltage source electrically connected to said test chamber.

19. An apparatus according to claim 18, further comprising a processor.